[SUPPLEMENTARY MATERIAL]

Nine thousand years of optimal toolstone selection through the North American Holocene

Jeremy C. Williams[1], Diana M. Simone[1], Briggs Buchanan[2], Matthew T. Boulanger[3], Michelle R. Bebber[4] & Metin I. Eren[4,5,*]

[1] Department of Geology, Kent State University, 221 McGilvrey Hall, 325 South Lincoln Street, Kent, OH 44242, USA

[2] Department of Anthropology, University of Tulsa, Harwell Hall, 800 South Tucker Drive, Tulsa, OK 74104, USA

[3] Department of Anthropology, Southern Methodist University, 6425 Boaz Lane, Dallas, TX 75205, USA

[4] Department of Anthropology, Kent State University, 750 Hilltop Drive, Kent, OH 44242, USA

[5] Department of Archaeology, Cleveland Museum of Natural History, 1 Wade Oval, Cleveland, OH 44106, USA

[*] Author for correspondence (Email: meren@kent.edu)

In order to conduct loss on ignition (LOI), chert tool samples must be powdered to ensure homogeneity and complete loss of impurities and volatiles. The initial weight of crucible (M_{cruc}), along with 2-3g of powdered chert sample plus crucible ($M_{Initial}$) were recorded. Powder chert samples were ash at 550°C for one hour in a muffle furnace twice, in between heating treatment, samples were cooled to room temperature and stirred, after the second 550°C treatment, samples were cooled to room temperature and weighed (M_{550}). After the 550°C treatment, powdered chert tools were ash to 850°C for two hours, in the middle of the 850°C treatment samples were stirred once to ensure that all samples were ash, after the 850°C treatment, samples were cooled to room temperature and weighed (M_{850}). Using the various weight recorded (i.e. M_{cruc}, $M_{Initial}$, M_{550}, and M_{850}) we calculated total LOI by:

LOI_{550} (wt. %) = $[(M_{Initial} - M_{550})/(M_{Initial} - M_{cruc})] \times 100$

LOI_{850} (wt. %) = $[(M_{550} - M_{850})/(M_{Initial} - M_{cruc})] \times 100$

Total LOI (wt. %) = $LOI_{550} + LOI_{850}$

Essentially flint is defined as having a chemical composition of SiO_2, however, this chemical

composition does not explain other compounds in lower concentration. We wanted to understand the amount of volatiles associated with the lithification of making flint. Flint derives from siliceous ooze of skeletal microorganisms (radiolarians and diatoms), during the diagenetic/lithification process, the siliceous ooze incorporates other chemical compounds that are not a part of the original makeup. These compounds are primarily associated with the gases (trapped inside the rock), organic compounds, and inorganic carbon compounds that may be incorporated into the rock, we deem these as impurities. Therefore, the two-step LOI process outlined in the manuscript accounts for "burning off" the volatiles and isolating heavy rock forming compounds such as SiO_2. We measure the ash flint in the form of a glass bead to account accurately for heavy rock forming compounds (SiO_2).

Table S1. Data used in the analyses, as well as supplemental data.

Name	Artefact Info	Weight (g)	Length (mm)	Width (mm)	Thickness (mm)	LOI (wt. %)	SiO_2 (wt. %)	Macroscopic Chert Type	Cluster (Justice 1987)	Point Type (Justice 1987)	Predominant Period (Justice 1987)	Approximate Age (Justice 1987)
ST1	NM 65	4.299	30.48	20.93	6.37	1.82	90.65	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000-1000 BC
ST2	CO-2, SUB H-2, 0-6	12.935	48.51	27.63	6.99	1.40	96.39	Upper Mercer	Kirk Stemmed Cluster	Kirk Stemmed	Early Archaic	6900-6000 BC
ST3	NM, CO-2, S	11.345	38.57	32.94	7.94	1.01	96.41	Delaware	Stanly Stemmed Cluster	Stanly Stemmed	Middle Archaic	6000–5000 BC
ST4	CO-2, SUB E1, 0-4	4.226	24.87	20.04	7.50	1.11	95.57	Upper Mercer	LeCroy Cluster	LeCroy	Early Archaic	6500–5800 BC
ST5	CO-2, A-2, 0-4	12.166	38.48	36.04	10.36	4.39	92.03	Upper Mercer	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST6	CO-2, M-1, 0-4	4.268	22.55	22.93	7.69	1.22	95.82	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST7	CO-2, SUB-I1 -I2	5.993	34.01	19.30	7.73	1.31	96.19	Plum Run	Lowe Cluster	Chesser Notched	Late Woodland	AD 300–700
ST8	CO-2, Test-5, 0-15	8.146	52.81	20.42	7.12	1.31	93.85	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST9	CO-2, I-2, 0-4	3.222	31.75	22.86	5.08	1.91	94.92	Upper Mercer	Stanly Stemmed Cluster	Stanly Stemmed	Middle Archaic	6000–5000 BC
ST10	CO-2, O-2, 0-4	2.243	27.70	12.21	5.93	1.64	95.55	Upper Mercer	Rice Lobed Cluster	St. Albans Side Notched	Early Archaic	6900–6500 BC
ST11	CO-2, RR-5	3.545	31.62	15.22	7.45	1.39	95.82	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST12	CO-2, SW	1.866	26.28	18.96	4.31	0.66	95.12	Flint Ridge	Stanly Stemmed Cluster	Stanly Stemmed	Middle Archaic	6000–5000 BC
ST13	CO-2, H-1, 0-4	3.517	27.96	16.27	6.61	1.27	98.05	Delaware	Late Woodland/Mississippian Triangular Cluster	Madison	Late Woodland	AD 800–1300
ST14	CO-2, $	3.306	40.23	23.93	5.13	1.24	96.56	Delaware	Kirk Corner Notched Cluster	Charlston Corner Notched	Early Archaic	7900 BC
ST 15	CO-2, SC	6.584	30.25	17.75	4.57	1.41	96.09	Upper Mercer	Late Woodland/Mississippian Triangular Cluster	Madison	Late Woodland	AD 800–1300
ST16	None written on artefact	7.559	27.65	27.80	7.73	2.76	95.68	Upper Mercer	Kirk Corner Notched Cluster	Charlston Corner Notched	Early Archaic	7900 BC
ST17	CO-2, Milton, 0-11	3.697	37.19	13.78	6.08	1.84	95.97	Upper Mercer	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500–1000
ST18	CO-2, G2, 0-4	5.990	49.19	21.39	5.88	3.67	91.01	Upper Mercer	Lowe Cluster	Steuben Expanded Stem	Late Woodland	AD 100–800
ST19	CO-2, S	6.225	47.00	15.58	10.24	1.36	96.89	Upper Mercer	Late Archaic Stemmed Cluster	Karnak Stemmed	Late Archaic	3700–3000 BC
ST20	CO-2, SC	4.543	25.64	24.44	6.68	3.04	91.02	Delaware	n/a	n/a	n/a	n/a
ST21	CO-2, SUB-G1, o-6	12.062	50.12	25.24	8.74	1.56	95.62	Delaware	Late Woodland/Mississippian Triangular Cluster	Madison	Late Woodland	AD 800–1300
ST22	CO-2, G-1, 6-10	8.465	53.43	24.06	6.86	1.68	95.63	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST23	None written on artefact	5.345	39.95	18.23	5.34	1.36	94.25	Upper Mercer	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500-1000
ST24	NM G2 ???	6.503	47.71	16.22	5.88	1.97	95.32	Delaware	Late Woodland/Mississippian Triangular Cluster	Madison	Late Woodland	AD 800–1300
ST25	CO-2, Scott, 0-8	5.388	43.84	17.04	6.32	1.29	96.00	Upper Mercer	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500–1000
ST26	None written on artefact	9.166	35.04	25.36	9.36	1.23	96.94	Upper Mercer	Late Woodland/Mississippian Triangular Cluster	Levanna	Late Woodland	AD 700-1200
ST27	CO-2, SC	6.184	42.03	16.29	8.19	1.31	96.20	Flint Ridge	Late Woodland/Mississippian Triangular Cluster	Madison	Late Woodland	AD 800–1300
ST28	None written on artefact	8.366	32.52	33.57	7.96	1.33	95.52	Upper Mercer	Rice Lobed Cluster	MacCorkle Stemmed	Early Archaic	7000-6500 BC
ST29	None written on artefact	5.502	22.48	24.83	7.41	0.93	97.13	Upper Mercer	Rice Lobed Cluster	MacCorkle Stemmed	Early Archaic	7000–6500 BC
ST30	CO-2, G-2, 4-6	2.363	12.86	17.96	7.77	0.51	96.13	Upper Mercer	Table Rock Cluster	Bottleneck Stemmed	Late Archaic	3770–3000 BC
ST31	CO-2, S	1.008	18.64	9.03	5.61	0.60	93.74	Flint Ridge	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST32	CO-2, F-2, 6-10	0.926	10.08	18.03	4.20	1.62	94.94	Upper Mercer	Table Rock Cluster	Bottleneck Stemmed	Late Archaic	3770–3000 BC
ST33	CO-2,E-1, 0-4	6.418	40.07	20.56	7.11	1.02	97.33	Upper Mercer	Kirk Corner Notched Cluster	Kirk Corner Notched	Early Archaic	7500–6900 BC
ST34	SUB-D2, 0-4	3.168	30.38	16.38	4.34	9.36	89.98	Flint Ridge	Kirk Corner Notched Cluster	Kirk Corner Notched	Early Archaic	7500–6900 BC
ST35	CO-2, SC	5.975	46.11	17.71	7.17	0.75	96.63	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST36	CO-2, Me / 0-18	2.309	30.25	15.28	3.27	1.39	95.12	Upper Mercer	Stanly Stemmed Cluster	Stanly Stemmed	Middle Archaic	6000–5000 BC
ST37	CO-2,N-2, 0-4	1.826	29.84	17.94	4.07	0.99	96.88	Upper Mercer	Stanly Stemmed Cluster	Stanly Stemmed	Middle Archaic	6000–5000 BC
ST38	CO-2, G-2,G-8	4.167	27.79	24.50	6.32	1.08	96.42	Upper Mercer	Kirk Corner Notched Cluster	Kirk Corner Notched	Early Archaic	7500–6900 BC
ST39	NM, 3/21/66	8.669	41.89	21.09	8.14	1.05	96.63	Upper Mercer	Lowe Cluster	Chesser Notched	Late Woodland	AD 300-700
ST40	CO-2, Me, 0-18	4.286	32.28	20.00	5.79	1.08	96.78	Upper Mercer	Kirk Corner Notched Cluster	Kirk Corner Notched	Early Archaic	7500–6900 BC
ST41	CO-2, Scott: 8 ->	8.044	39.87	26.80	7.28	1.99	96.12	Upper Mercer	Kirk Corner Notched Cluster	Kirk Corner Notched	Early Archaic	7500–6900 BC
ST42	CO-2, S	4.518	28.90	21.79	7.45	0.90	97.72	Flint Ridge	Matanzas Cluster	Brewerton Eared Triangle	Late Archaic	2890–1723 BC
ST43	CO-2, Test-2, 0-4	3.012	25.07	21.64	6.04	1.22	96.88	Flint Ridge	Table Rock Cluster	Bottleneck Stemmed	Late Archaic	3770–3000 BC
ST44	CO-2, Do NNE, Bh	14.379	39.14	37.29	8.38	1.20	96.52	Flint Ridge	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000–1000 BC
ST45	CO-2, J-2 / 6-8	5.370	25.92	23.36	9.14	1.13	96.67	Upper Mercer	Lowe Cluster	Steuben Expanded Stem	Late Woodland	AD 100–800
ST46	CO-2, X2 / 4-6	12.145	56.89	25.05	7.43	1.40	96.72	Upper Mercer	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST47	CO-2, Test A, 6-12	9.395	49.11	25.38	7.60	1.33	96.03	Upper Mercer	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST48	CO-2, Wa/14-18	13.018	55.59	23.92	8.88	0.81	97.80	Flint Ridge	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST49	NM 64	8.136	46.71	20.18	8.56	3.17	92.74	Upper Mercer	Dickson Cluster	Adena Stemmed	Early Woodland	800-300 BC
ST50	CO-2, L-1/0-4	15.290	56.51	24.62	12.29	0.66	97.96	Flint Ridge	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST51	None written on artefact	7.685	36.42	23.08	8.69	0.57	97.80	Upper Mercer	Table Rock Cluster	Table Rock Stemmed	Late Archaic	3000-1000 BC
ST52	CO-2, HaS	18.645	68.23	25.29	11.69	1.22	96.34	Upper Mercer	Late Archaic Stemmed Cluster	Karnak Unstemmed	Late Archaic	3700–3000 BC
ST53	CO-2, Sc	14.751	51.75	22.48	12.42	1.36	96.15	Upper Mercer	Late Archaic Stemmed Cluster	Karnak Unstemmed	Late Archaic	3700–3000 BC
ST54	CO-2, W 5	8.660	45.46	21.75	8.36	1.27	96.86	Upper Mercer	Dickson Cluster	Adena Stemmed	Early Woodland	800–300 BC
ST55	CO-2, Test 7, 0-13	15.418	58.67	24.75	11.01	2.36	90.32	Upper Mercer	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500–1000
ST56	CO-2, Sc	14.437	49.21	23.35	12.35	1.15	95.87	Upper Mercer	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500–1000
ST57	None written on artefact	13.570	57.88	20.74	10.67	1.78	93.23	Upper Mercer	Early Woodland Stemmed Cluster	Cresap Stemmed	Early Woodland	1000-500 BC
ST58	CO-2, L-1/4-6	11.129	44.68	24.28	8.95	1.19	96.26	Delaware	Unnotched Pentagonal Cluster	Jack's Reef Pentagonal	Late Woodland	AD 500–1000
ST59	CO-2, SUB-F1, 0-6	14.245	51.22	24.32	11.69	1.66	95.66	Upper Mercer	n/a	n/a	n/a	n/a

References

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